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# METHOD AND APPARATUS FOR PRODUCING IMAGES

**RELATED APPLICATION**

This application is based on and claims the benefit of the
5    filing date of AU application no. 2004901752 filed 1 April
2004, the contents of which are incorporated herein by
reference in its entirety.


**FIELD OF THE INVENTION**

10   The present invention relates to a method and apparatus
for producing visual images, and is of particular but by
not means exclusive application in processing an image for
storage or transmission.


15   **BACKGROUND OF THE INVENTION**

The international television video standards in common use
today are the NTSC (National Television System Committee),
PAL (Phase Alternating Line) and SECAM (Système
Electronique Couleur Avec Mémoire) standards.  All of the
20   these television video standards include the composition
of images by the same fundamental approach: each image is
composed of horizontal lines scanned across the image
plane.  These scan lines form a set of nearly horizontal
image stripes - referred to as lines - that form the
25   actual image, with a single image comprising two
consecutive sets of interlaced or interleaved lines.

That is, a first (approximately) half of the scan lines
are configured to occupy only every second line of the
30   full image and the remaining or second half of the scan
lines occupy the intermediate positions.  The two half
sets are thus interlaced to form the actual image.  Such a
complete interlaced image is referred to as an "image
frame" and comprises an "odd image field" and an "even
35   image field".

The number of scan lines defined for each of these
international standards differs.  NTSC defines 525 lines

at a scan rate of 30 frames (60 fields) per second; PAL
and SECAM define 625 scan lines at a scan rate of 25 (50
fields) frames per second. The signal is constructed so
that the scan lines are interlaced. The interlaced signal
5    is a raster scan pattern where each second line scans for
a full display height first and then the interlaced lines
between these are scanned as the even image field. Thus,
in NTSC lines 1 to 265 (the odd field) are scanned,
followed by - interlaced - lines 266 to 525 (the even
10   field). In PAL and SECAM, lines 1 to 313 (the odd field)
are scanned, followed by - interlaced - lines 314 to 625
(the even field).

A video sequence is collected as a series of image frames,
15   each acquired in turn by means of an image sensor, and
transmitted as a sequence of pairs of odd and even fields.
Figure 1 is a schematic representation of the resulting
sequence of odd and even fields in a standard television
image. The sequence is then displayed (such as on a
20   television) as alternate odd and even fields, as depicted
schematically in figure 2 in the interlaced manner
described above. Video signals that conform to these
international standard methods of transmission thus
comprise a plurality of image frames each of which is
25   composed of two fields; such video signals thus constitute
standard television video signals.

One specific example of such a standard television signal
is "composite" video, which incorporates the image fields
30 . and line synchronisation information within a singe
(hence, "composite") signal. A wide range of equipment,
including displays and digital video recorders, are
available for use with composite video. Composite video
can be provided in PAL, NTSC or SECAM format. Further,
35   composite video can be black and white or full colour.
Many digital video cameras, such as those used in CCTV
(closed circuit television) security applications, capture
video information using a CCD (charge coupled device) or

- 3 -

similar image sensor array and then output the video
images in an analogue composite video format.

This approach provides a good representation of motion
5    video, owing partly to optical persistence in the display
device and partly to the nature of human visual perception
(as the image is constantly being updated with new image
fields that provide progressively updated information
about movement in the image scene to the human eye).
10

However, this approach to constructing an image provides
poor resolution still images when, for example, a full
frame is frozen or printed.  Each image field is captured,
in PAL, approximately 20 ms apart (i.e. with a sample rate
15   of 50 Hz) or, in NTSC, 16.7 ms apart (i.e. with a sample
rate of 60 Hz), so combining the fields will cause
smudging or fuzziness on any moving part of the image.
In such cases, any movement that occurs in the field of
view between the capturing by the image sensor of the odd
20   field and the capturing of the even field with cause
blurring of a still taken from the video, such as in the
form of a freeze-frame or printed image.  In some
applications, such as industrial video security and
digital video recorders, the ability to output high
25   quality still images for further analysis, recognition,
printing, documentation and use in evidence is important.
The international video standards are well established and
widely used with large existing infrastructure in cables,
transmission methods, video switches, displays and video
30   recorders including digital video recorders, so a umber of
attempts have been made to retain these standards while
still providing still images of acceptable quality.

Thus, one existing technique for avoiding motion blurring
35   entails displaying the image from only one field (odd or
even); this reduces or avoids motion blurring but at the
cost of reduced image resolution.  In some applications
this approach constitutes the use of a "2CIF" image rather

- 4 -

than the full "4CIF" image. (The full image frame image
is in some applications referred to as a 4CIF image when a
resolution of 704 × 576 pixels is employed, this being
four times the number of pixels in a CIF (Common
5   Intermediate Format) image of 352 × 288 pixels.)

Indeed, most digital video recorders presently record only
odd frames or even frames; this technique is, as a result,
referred to as 2CIF mode recording.
10

Another existing technique employs de-interlacing
filtering, typically embodied as software, but it is only
partially effective and reduces the available resolution.

15   It is an object of the present invention to provide a
method of capturing or transmitting video signals in
signal formats such as international standards NTSC, PAL
or SECAM that allows the rendering of still images (such
as for display or printing) with reduced motion blurring
20   or the like.

SUMMARY OF THE INVENTION
Thus, according to a first broad aspect of the invention,
there is provided a method for processing an image for
25   storage or transmission, comprising:
            dividing an image in the form of image data into
three or more image data subsets; and
            sequentially outputting the image data subsets as
fields in or as a television signal.
30

In one embodiment, the method includes receiving or
capturing the image. It will be appreciated that, in this
embodiment, the television signal may include conventional
image frames (in, for example, NTSC, PAL or SECAM format)
35   as well as the fields comprising the image data subsets.
It will also be appreciated that the image data may be
converted from one form or format to another between being
captured and divided or output (such as from analogue to

digital, or from one digital form to another), but that
reference to "image data" embraces such data irrespective
of any such conversions or transformations.  It will also
be understood that capturing the image data may comprise
5    the original capturing of the data (such as by videoing a
live scene with a video camera), or capturing previously
collected video data for use according to this method
(such as from a database of existing data in video
format).

10

In one embodiment, the method includes forming the subsets
so as to be interlaceable.  This allows the image data
subsets to be combined to form higher resolution stills.
If a plurality of images has been captured, some or all of
15   these images may be output in moving form.

The method thus allows one or more images to be
reconstituted from the image data subsets; if desired,
still images can be output with the sharpness of the
20   original image data, since - unlike with video data
captured in interlaced format by conventional means -
these images are converted into interlaced format after
being captured.

25   In one embodiment, the method includes dividing a
plurality of images into respective sets of three or more
image data subsets, and sequentially outputting the sets
of image data subsets as fields in a television signal.
The method may include forming each of the sets of image
30   data subsets so as to be interlaceable.

In another embodiment, the method includes outputting the
image data subsets as adjacent fields in an otherwise
conventional television signal.

35

The method may include outputting the image data subsets
either as odd fields or as even fields in the television
signal.  The method may include transmitting the

- 6 -

television signal for remote storage or display.

This aspect of the invention also provides a method for
processing images for storage or transmission, comprising:
5          forwarding one or more images as image data to a
computer system;
           forwarding to the computer system command data
for prompting the system to divide the image data
corresponding to each of the images into three or more
10   image data subsets; and
           receiving from the computer system output
comprising the image data subsets.

In a second broad aspect, the invention provides an
15   apparatus for processing images for storage or
transmission, comprising:
           a data input for receiving or capturing an image
as image data;
           a processor for dividing the image data into
20   three or more image data subsets; and
           an output for outputting the image data subsets
in or as a television signal.

In one embodiment, the apparatus includes an image capture
25   mechanism for capturing the image.

In another embodiment, the processor is operable to form
the subsets so as to be interlaceable.

30   The apparatus may be or comprise a camera. In one
embodiment, the processor is operable to divide a
plurality of images into respective sets of three or more
image data subsets, and the output is operable to
sequentially output the sets of image data subsets as
35   fields in or as a television signal. The processor may
then be operable to form each of the sets of image data
subsets so as to be interlaceable.

In another embodiment, the apparatus includes a display
for displaying the image, the image data subsets or both
the image and the image data subsets.

5     The processor may be operable to divide the image data
into an even number of image data subsets.  The apparatus
may be operable to transmit the image data subsets for
remote display.

10    In a third broad aspect, the invention provides a video
camera, comprising:
            an imaging subsystem for capturing one or more
images as image data;
            a processor for dividing the image data
15    corresponding to each of the images into at least three
image data subsets; and
            an output subsystem operable to output the image
data subsets in or as a television signal.

20    The processor may be operable to divide the image data
corresponding to each of the images so as to be
interlaceable.

The output subsystem may be operable to output the image
25    data subsets in or as a television signal in standard
NTSC, PAL or SECAM format.

According to a fourth broad aspect, the invention provides
a method for inserting at least one image in the form of
30    image data into a television signal, comprising:
            dividing the image into a set of image data
subsets; and
            inserting the set into the television signal with
each subset corresponding to a respective field of the
35    television signal and with the set preceded or followed in
the television signal by a conventional image frame.

In one particular embodiment, the image is one of a

- 8 -

plurality of images each in the form of image data and the
method includes:

dividing the image data corresponding to each of
the images into a respective set of image data subsets;

5  and

inserting the sets periodically into the
television signal with each subset corresponding to a
respective field of the television signal and with each of
the sets preceded or followed in the television signal by

10  a conventional image frame.


Thus, each set of a plurality of image data subsets
appears in the signal, preferably - for each set - with
the subsets adjacent to each other.  In one embodiment,

15  the groups are separated from one another by an equal
number of frames.


According to a fifth broad aspect, the invention provides
a method of decoding a television signal, the method

20  comprising:

extracting first image data from the odd image
fields of the television signal; and

extracting second image data from the even image
fields of the television signal;

25            wherein one of the first image data and second
image data comprises a first set of images that are
sequentially displayable as a motion video and the other
of the first image data and second image data comprises a
second set of images that are assemblable into a further

30  image.


In a particular embodiment, the second set of images are
assemblable into a plurality of further images.  The
plurality of further images may be sequentially

35  displayable as a further motion video; the further motion
video may comprise a manipulated version of the motion
video derived from the first set of images.

- 9 -

According to a fifth broad aspect, the invention provides
a method for processing an image for storage or
transmission, comprising:

        dividing an image in the form of image data into
5    a plurality of image data subsets; and
        sequentially outputting the image data subsets as
fields in or as a television signal;
        wherein the subsets are both reassemblable by
interlacing according to a conventional television
10   standard to form a first image, and otherwise
reassemblable to form a second image.

The second image may, superficially, appear similar to the
first image, but differ in resolution, colour balance,
15   contrast, etc.


BRIEF DESCRIPTION OF THE DRAWING
In order that the invention may be more clearly
ascertained, embodiments will now be described, by way of
20   example, with reference to the accompanying drawing, in
which:
        Figure 1 is a schematic representation of the
sequence of odd and even fields in a television image
according to the background art;
25      Figure 2 is a schematic representation of the
sequence of odd and even fields as subsequently displayed
in interlaced form according to the background art;
        Figure 3A is a schematic view of a high
resolution video camera according to an embodiment of the
30   present invention, shown with a digital video recorder;
        Figure 3B is a schematic view of the camera of
figure 3A, configured for use with an alternative a
digital video recorder;
        Figure 4 is a schematic representation of the
35   decomposition of a high resolution image into a television
video signal according to an embodiment of the present
invention;
        Figure 5 is a schematic representation of the

- 10 -

reassembly of a high resolution image from a television
video signal according to an embodiment of the present
invention; and

Figure 6 is a schematic representation of the
5    decomposition of a television video signal into a video
signal and the components of a high resolution image
according to an embodiment of the present invention.


DETAILED DESCRIPTION OF THE EMBODIMENTS
10   A high resolution video camera according to an embodiment
of the present invention is shown schematically at 10 in
figure 3A, together with - and electronically coupled to -
a digital video recorder 12.  It will be understood by
those in the art that the digital video recorder 12 is -
15   in this figure - provided merely as an exemplary device to
which the camera 10 might transmit its output.  In other
applications, for example, the camera 10 might transmit
its output to a video display for immediate display, or to
a remote location for storage or display (by cable,
20   wirelessly, via the internet, or otherwise).


The video camera 10 includes an imaging subsystem 14
(including lens assembly 16 and image sensor 18) for
capturing high resolution video images as video data, an
25   initial processor 19 for performing some initial image
processing (and for controlling the storage of images),
local working memory 20 in which video data is stored, a
data processor 22 for processing the video data, and an
output subsystem or stage 24 for outputting a video signal
30   (in this example, via cable 26 to digital video recorder
12).  Such outputting can include performing digital to
analogue conversion by essentially conventional
techniques.  The output signal is typically a composite
video signal conforming to the NTSC, PAL or SECAM
35   standard, though other outputs are possible as is
described below.


In use, the image sensor 18 is used to capture one or more

high resolution images, which are then stored by initial
processor 19 in memory 20 (and for subsequent processing -
as is described below - by processor 22). An image stored
in memory 20 may be updated from the sensor 18 at the full
5    field update rate, with only the resolution required for
image fields transferred to the output stage 24 for
encoding into a standard motion video signal.
Alternatively, the images can be captured into the memory
20 at a lesser rate so that a high resolution image can be
10   encoded over a set of consecutive image fields.

Thus, the camera 10 is operable to capture non-interlaced
video images with a resolution that is greater than the
resolution required for a full frame of standard video as
15   a single image. These images are stored in memory 20 so
that they can be broken down by processor 20 and output as
two fields at the correct timing to form an industry
standard television video signal such as PAL, NTSC or
SECAM. (It will be noted, however, that the processor 20
20   may be configured to controllably divide the video data
corresponding to each video frame into more than two
fields or subsets of video data, and particularly into
even numbers of such fields.)

25   Thus, the processor 20 is operable to divide each image
frame into a pair of interlaceable fields suitable for
transmission (and recording, display, etc) as standard
television image signals. The processor 20 is
controllable by means of a control panel (not shown) on
30   camera 10 to process the video data so that the ultimate
output comprises pairs of fields that conform to a user-
selected one of the NTSC, PAL or SECAM standards. These
are passed to output stage 24, which output these fields
via cable 26 to digital video recorder 12 as composite
35   video output. Digital video recorder 12 has a digital
input for receiving the composite video output.

However, odd and even fields can be treated separately, as

- 12 -

they are formed in camera 10 either from different
original images or by the decomposition of single images
(as is described below). Consequently, when the output of
camera 10 is received, the odd and even fields can

5   separated into two separate video output streams. This
approach has particular application in systems such as
existing 2CIF digital video recorders used in video
security applications that already extract only the odd
and even frames for analysis or recording or display.

10

Thus, referring to figure 3B, digital video recorder 12'
is comparable to video recorder 12 but has two digital
inputs 29a and 29b: first digital input 29a is provided to
receive (and record) at 2CIF resolution from odd image

15  fields only, and second digital input 29b is provided to
receive (and record) at 2CIF resolution from even image
fields only. Video recorder 12' thus receives (via cable
26) a stream of (odd and even) image fields that it
records separately, but which can be combined into a

20  standard television picture. Furthermore, any respective
pair of odd and even fields can be combined into a still
(for printing or display) that comprises the
reconstitution of an original non-interlaced image
captured by the camera 10. Consequently, such stills will

25  not suffer from the blurring that occurs when displaying a
still formed by combining odd and even fields captured in
interlaced fashion (and hence at different times).

The advantage of this latter approach is that the

30  composite video output from the camera 10 is compatible
with existing video displays and recorders and will
display and replay normally but with increased motion
smoothness as individual fields are not supplied as
completely new images captured individually for every

35  field. However, when associated image fields are combined
and then displayed or printed as a still image, the image
will be a high resolution image that is essentially free
of interlacing effects and of that motion blurring that is

due to interlacing.

This principle can be applied to a single odd and even
image field pair to form a image frame from a single image
5    captured at the camera (as described above) or extended to
provide very high resolution images from large numbers of
image fields combined together.  The image fields formed
in the camera to be combined later to form a high
resolution image would typically comprise a set of odd and
10   even fields in sequence.

This approach thus has the distinct advantage that each
pair of odd and even image fields constitutes a complete
interlaced image at standard resolution and can be
15   displayed or recorded and transmitted using standard video
equipment and techniques such as composite video while
still providing the opportunity to combine a number of
specific image fields to form a very high resolution
image, particularly suited to still image reproduction.
20

The sets of image fields configured in the camera to be
combined to form a high resolution image need not occur
continuously in the video signal.  For example, the
processor 22 may be configured to pass to output stage 24
25   essentially conventional pairs of odd and even fields for
interlacing and display but, periodically (such as twice
per second), to insert a high resolution image such as
comprising the equivalent of six combined fields into the
video stream.  For example, in NTSC mode - in which 60
30   2CIF fields are transmitted per second - the camera 10
could be configured to insert a high resolution image
comprising the equivalent of six combined fields into the
video stream twice per second and hence after each
transmission of 15 pairs of 2CIF fields.
35

Such variants, and method for using the camera 10, are
discussed in greater detail below.

- 14 -

In one example of the use of camera 10, a high resolution
image captured, assembled and transmitted as a group of
four image fields in an otherwise standard video signal.
This technique employs a particular approach for
5    decomposing the image into pixels.

As described above, camera 10 can be used to capture high
resolution images.  Each image is stored in memory 20.
The pixels of each image are - in this example - allocated
10   to four individual image fields by means of processor 22.
Each of these four fields is then treated as a standard
digital image field for conversion to a standard video
signal using the digital to analogue video encoder
electronics of output stage 24.  These electronics insert
15   each field (and the scan lines that constitute each field)
into the output video signal at the correct timing for the
signal to conform to NTSC, PAL or SECAM format.

This procedure is illustrated schematically in figure 4.
20   Figure 4 depicts schematically a high resolution image 40
comprising a plurality of individual pixels, captured as a
single image by camera 10.  This high resolution image 40
is stored in memory 20 and divided into a set of pixels
that can be read out of memory 20 and assigned to
25   individual fields.

In this example, the image 40 is split into four fields.
Illustrative region 42 of image 40 is shown enlarged at
42', in which is depicted the individual pixels 44.  The
30   pixels are assigned in a regular pattern to four groups;
in this example, each second pixel in x and y directions
is assigned to one of the four separate fields, and as a
result the pixels are equi-spaced both in the original
image and in each of the final fields.  Other numbers of
35   final fields could be employed and, in some applications,
it may not be essential that the pixels allocated to any
particular field be equi-spaced in the original image or
in the ultimate field.

- 15 -

Thus, in this example, those pixels labelled "1" are
assigned to a first field 46a, those labelled "2" are
assigned to a second field 46b, those labelled "3" are
5    assigned to a third field 46c and those labelled "4" are
assigned to a fourth field 46d.  Clearly each of the
resulting image fields 46a, 46b, 46c and 46d has a quarter
the resolution of the original (high) resolution image 40.

10   It will be noted that those pixels labelled "1" and those
labelled "2" are extracted from adjacent horizontal lines
of original image, so image fields 46a and 46b are
interlaceable, that is, suitable for interlacing.
Similarly, those pixels labelled "3" and those labelled
15   "4" are extracted from adjacent horizontal lines, so image
fields 46c and 46d are interlaceable.  Image fields 46a,
46b, 46c and 46d are then inserted as consecutive fields
in a standard (i.e. NTSC, PAL or SECAM) format video
signal 48 by mean of the output stage 24.  These standards
20   require two fields per frame, so the first two image
fields 46a, 46b (which, as has been noted, are
interlaceable) are used for a first frame $n$, and the
second two image fields 46c, 46d (which are also
interlaceable) are used for a second frame $n+1$.
25

Each subsequent high resolution image is similarly divided
into four image fields, and thereby provide subsequent
image frames $n+2$, $n+3$, etc.

30   As will be appreciated, the original high resolution image
40 can be decomposed into the (lower resolution) image
fields by other suitable techniques; in each case the
result are a plurality of lower resolution representation
of the original full view of camera 10 such that the
35   ultimate video signal can be replayed as normal motion
television video.  As the constructed image fields are
interlaced on replay, the construction of the fields can
be optimised to provide a steady good clarity image as the

- 16 -

fields are replayed as moving video.

As the original high resolution image is processed into
individual image frames to be issued as a timed sequence
5    in the standard television signal there is a opportunity
to provide additional processing of the image and its
constituent data pixels.  For example, noise reduction,
averaging or filtering may be employed by means of
processor 22 to further enhance the image quality issued
10   from the camera 10.

Where the image sensor 18 is a CMOS type image sensor, the
sensor itself can be employed to act as the image memory
and the image fields can be constructed by the processor
15   22 by reading and processing pixel sets directly from the
image sensor 18 to form individual image fields for
transfer to the output stage 24 of the camera 10.

In another example, a high resolution image can be
20   reconstructed from a number of image fields.  This
procedure essentially reverses that described by reference
to figure 4, and is illustrated schematically in figure 5.
Referring to figure 5, each frame of a video signal 50
(generated by means of the approach described above) is
25   decomposed into odd and even fields.  Each set of four
consecutive fields 52a, 62b, 52c, 52d is then combined
into a single high resolution image 54.  As can be seen
from sample region 56 (enlarged at 56'), the pixels 58 of
the four fields 52a, 62b, 52c, 52d are in effect
30   interlaced into the form in which the original high
resolution image was collected.

The number of image fields that are combined into a single
high resolution image generally depends on the resolution
35   available from the image sensor 18.  By way of example, a
single image field can encode around 400,000 pixels when
encoded into standard video using typical industry
electronics.  On this basis it would be appropriate to

encode the output from a 2.2 megapixel image across
approximately 8 image fields to deliver an output image
over NTSC, PAL or similar that can be recombined into a
high resolution image approaching the original image
5      resolution.

In effect this approach trades off overall motion
smoothness of the video stream when replayed on standard
television or video equipment for significantly increased
10     image resolution when consecutive sets of image fields are
combined in other devices such as computer display
software or a digital video recorder.

This approach has the advantage that high resolution
15     images can be embedded within a standard NTSC, PAL or
SECAM video signal, and transmitted, switched,
multiplexed, stored or displayed using existing equipment,
cables and infrastructure.  The images can be recoded on
existing equipment, such as video recording equipment.
20     When a high resolution image is required for analysis,
recognition or preparation of a high resolution still
image or printout, the individual fields generated from
the high resolution image can be recombined in a post
processing stage into the original high resolution image.
25     In the case of a digital video recorder, the individual
frames are already digitised and saved as digital pixel
data for each video field.  These fields can then be
combined by means of computer software for subsequent
display or printing.  This feature can be built into the
30     software normally provided with a digital video recorder
for searching, replay of video, display of freeze frames
and printing still images.

In another example of the use of camera 10, the resolution
35     of the camera can be switched dynamically, that is, the
effective image frame rate versus image update rate can be
dynamically changed in the camera.  For example, camera 10
- in NTSC mode - would normally output full motion video

- 18 -

at 30 frames per second (i.e. 60 fields per second); every
field comprises a new image of normal video resolution,
captured sequentially and hence at distinct times.
However, in addition the camera 10 is operable to
5    intermittently insert a series of image fields generated
from a high resolution original image, so that - if
desired - those fields can be recombined in subsequent
processing to form a high resolution image.  The replay
software used to combine the image fields identifies sets
10   of fields intended to be combined by analysis of the image
data or by reference to identifying markers or frame group
numbers inserted into the image signal.  In a standard
television video signal (such as a NTSC, PAL or SECAM
signal), some of the scan lines encoded in each image
15   frame do not form a part of the image to be displayed.
These invisible lines are used for other purposes, such as
vertical sync equalization and encoding of text
information for subtitles.  The same technique by which
digital information is encoded in unused image lines for
20   subtitles can be used to encode data for the replay
software to identify groups of image fields intended to be
combined as a high resolution image.

Camera 10 is operable to dynamically insert high
25   resolution images into the video signal in response to a
specific event, which is used to trigger the capture of a
high resolution image and the insertion of that image into
the video signal as a set of related image fields.  Such
an event can comprise: an external command to the camera
30   from a data interface or digital input; an alarm trigger
on a digital input to the camera; and the output of image
processing within the camera.

Other events can arise from the analysis of low (i.e.
35   normal video) resolution images, and indicate that a
higher resolution image should be captured.  Such events
can include: the detection of movement in the field of
view of the camera; the detection of a person or face

- 19 -

within the field of view; the detection of text or numbers within the field of view; and the detection of a vehicle number plate within the field of view.

5    In another example of the use of camera 10 (in the configuration of figure 3B), odd field images can be derived from lower resolution images updated for every odd field.  Referring to figure 6, the odd fields in a television signal 60 are used to form a 2CIF image stream

10   62a of motion video at standard resolution.  Every odd field is an image captured at a single frame frequency.  The even fields are constructed in the camera 10 to be suitable for transmission 62b to a post-processing system for combining into high resolution images.  For example,

15   each group of either consecutive even image fields may be combined into a single high resolution image.

Video signal 60 thus performs as though it is a standard video signal for a conventional system such as a 2CIF

20   digital video recorder that only employs odd image fields. The camera 10 is then able to capture high resolution images less frequently, yet still also provide high resolution images embedded in the even image fields. Indeed, the images encoded on the odd and even fields can

25   be from different image sources, such as separate image sensors housed within camera 10.  It is envisaged, however, that camera 10 would include a single high resolution image sensor and provide regular lower resolution images for use, for example, as odd image

30   fields and less frequent high resolution images (suitably decomposed) for use as even fields in the finally encoded video signal.

This approach also allows camera 10 to incorporate a

35   software pan zoom tilt feature.  The camera can be constructed to capture high resolution images at the full field update rate.  One image stream is then encoded onto the odd fields as a video stream with the full field of

view of the camera.  The second one image stream is
constructed from the working video memory in the camera to
provide an image of only a subset of the field of view of
the camera.  The subset view may be controlled by commands

5    or data supplied to the camera to provide a form of image
pan, tilt or zoom by means of the camera software and
without movement of the camera.  The camera can then alter
the image resolution dynamically for either image stream
to provide the best balance of image update rate and image

10   resolution for the specific application.

Modifications within the scope of the invention may be
readily effected by those skilled in the art.  It is to be
understood, therefore, that this invention is not limited

15   to the particular embodiments described by way of example
hereinabove.

In the claims that follow and in the preceding description
of the invention, except where the context requires

20   otherwise owing to express language or necessary
implication, the word "comprise" or variations such as
"comprises" or "comprising" is used in an inclusive sense,
i.e. to specify the presence of the stated features but
not to preclude the presence or addition of further

25   features in various embodiments of the invention.

Further, any reference herein to prior art is not intended
to imply that such prior art forms or formed a part of the
common general knowledge.